Wall Framing

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Introduction

Purpose:
This unit will prepare students to frame, sheath, and erect wall sections of a wood structure for a one or two family dwelling unit.

Core Objective:
Upon completion of this unit students will demonstrate the ability to identify structural framing members of walls, estimate materials for, frame, sheath, and erect wall sections that would meet the minimum CABO one and two family dwelling unit builders code book standards. Students will demonstrate this knowledge with performance activities such as wall plate layouts, calculation of wall openings, and creating cross-sectional views of wood structures. A culminating activity that consists of individual students fabricating wall sections that would comply with the code would assess student knowledge.

Objectives:
After completing this unit students will be able to:

1. Identify and define wall-framing members used in wood structures.
2. Establish applicable codes.
3. Complete drawings associated with typical wall framing members properly placed.
4. Identify types of walls (load bearing, non-load bearing, dividing).
5. Label header types.
6. Calculate regular stud lengths.
7. Calculate jack (trimmer) stud lengths.
8. Calculate cripple stud lengths.
9. Calculate header lengths.
10. Identify architectural symbols used for walls.
11. Compute rough opening dimensions for openings.
12. Layout horizontal sole plates.
13. Layout vertical wall sections.
14. Estimate materials as per plan.
15. Apply methods of bracing walls.
16. Utilize methods of fastening.
17. Frame, sheath, erect, and brace a wall section to be code compliant.

Estimated Time:
Eight contact hours for theory.
Twelve hours for performance tasks.
Two hour assessment.

Standards

Industry Standards:
CABO

601.1 Application
601.1 Requirements
602.1 Identification of loads
602.2 Material Grade
602.3 Exterior Walls
602.3.1 Wind Pressure
602.3.2 Stud Spacing
602.3.3 Top Plate
602.3.4 Bearing Studs
602.4 Interior load bearing Partitions
602.5 Drilling and notching studs
602.6 Headers
602.6.1 Single Headers
602.6.2 Plywood Box Headers
602.6.3 Non-bearing wall Headers
602.7 Firestopping
602.8 Bracing
602.9 Wall bracing

New Standards Performance Standards:

E1. Reading

E1c. The student reads and comprehends informational materials to develop understanding and expertise and produces written or oral work that:

- **restates or summarizes information;**
- **relates new information to prior knowledge and experience;**
- **extends ideas;**
- **makes connections to related topics or information.**

E4b. The student analyzes and subsequently revises work to clarify it or make it more effective in communicating the intended message of thought. The student's revisions should be made in light of purposes, audiences, and contexts that apply to the work. Strategies for revising include:

- adding or deleting details;
- adding or deleting explanations;
- **clarifying difficult passages;**
- **rearranging words, sentences, and paragraphs to improve or clarify meaning;**
- **sharpening the focus;**
- **reconsidering the organizational structure;**
- rethinking and/or rewriting the piece in light of different audiences and purposes.

M1a. Uses addition, subtraction, multiplication, division, and exponentiation in forming and working with numerical or algebraic expressions (the statement has been modified).
M2f. Uses the Pythagorean Theorem in many types of situations, and works through more than one proof of this theorem.
M2n. Solves problems involving scale, such as in maps and diagrams.
M6a. Carries out numerical calculations and symbol manipulations effectively, using mental computations, pencil and paper, or other technological aids, as appropriate.

M6b. Uses a variety of methods to estimate the values, in appropriate units, of quantities met applications, and rounds numbers used in applications to an appropriate degree of accuracy.
M6c. Evaluates and analyzes formulas and functions of many kinds, using both pencil and paper and more advanced technology.
M6l. Uses tools such as rulers, tapes, compasses, and protractors in solving problems.
M6m. Knows standard methods to solve basic problems and uses these methods in approaching more complex problems.

Core Learning Experience Summary Chart

Student Tasks & Instructional Methodology for Each Learning Experience		
Student Learning Experiences	**Student Tasks**	**Instructional Methodologies**
Learning Experience I	Draw and define an elevation view of a wall section containing two corners, one partition, one door opening, and one window opening. Create a materials list from a given print.	Theory instruction with models and images. Demonstrate methods of figuring materials and do three demonstrations in a module format.
Learning Experience II	Complete fifteen wall section layouts starting with basic 16" and 24" on center markings initially and work progressively toward a wall section containing two corners, one partition, one door opening, and one window opening.	Assist and evaluate each section. Shop or site experience.
Learning Experience III	Complete six vertical wall layouts starting with one including only full wall studs with each layout and introducing more framing components. The sixth layout has two header sizes and three window heights.	Lecture introduction and demo. Shop experience to complete layouts.
Integrative/Review Experience	As per plan students will estimate materials for, and complete both horizontal and vertical layouts to architectural plan in a timed session.	Teacher will time all students and when the time is complete the students and the instructors will determine if the wall section will meet CABO standards.

Description of Core Assessment: product & performance
Students will construct a wall section individually in forty-five minutes. The wall will be 47 ½x 48" and include a window opening centered in the wall with a cripple stud at 24" on center. Sheathing will be applied on one side as per plan. Examining the final piece will be done with CABO standards and be examined with the instructor and the student on a one-on-one basis to take part in the evaluation.

Student Learning Experience 1

Purpose:
To define and give visual of wall framing components with structural purposes and estimate how much product would be required to construct a given wall section.

Estimated Time:
Three sixty-minute lessons followed by a minimum of sixty-minute application periods after each lesson.

Standards:
601.1 Application
- 601.2 Requirements
- 602.4 Identification of loads
- 602.5 Material Grade
- 602.6 Exterior Walls
  - 602.3.1 Wind Pressure
  - 602.3.2 Stud Spacing
  - 602.3.3 Top Plate
  - 602.6.4 Bearing Studs
- 602.7 Interior load bearing Partitions
- 602.8 Drilling and notching studs
- 602.10 Firestopping
- 602.11 Bracing
  Wall bracing

E1. Reading

E1c. The student reads and comprehends informational materials to develop understanding and expertise and produces written or oral work that:

- **restates or summarizes information;**
- **relates new information to prior knowledge and experience;**
- **extends ideas;**
- **makes connections to related topics or information.**

E4b. The student analyzes and subsequently revises work to clarify it or make it more effective in communicating the intended message of thought. The student's revisions should be made in light of purposes, audiences, and contexts that apply to the work. Strategies for revising include:

- adding or deleting details;
- adding or deleting explanations;
- **clarifying difficult passages;**
- **rearranging words, sentences, and paragraphs to improve or clarify meaning;**
- **sharpening the focus;**
- **reconsidering the organizational structure;**
- rethinking and/or rewriting the piece in light of different audiences and purposes.

M2n. Solves problems involving scale, such as in maps and diagrams.
M6a. Carries out numerical calculations and symbol manipulations effectively, using mental computations, pencil and paper, or other technological aids, as appropriate.
M6b. Uses a variety of methods to estimate the values, in appropriate units, of quantities met applications, and rounds numbers used in applications to an appropriate degree of accuracy.
M6c. Evaluates and analyzes formulas and functions of many kinds, using both pencil and paper and more advanced technology.
M6l. Uses tools such as rulers, tapes, compasses, and protractors in solving problems.

M6m. Knows standard methods to solve basic problems and uses these methods in approaching more complex problems.

Key Concepts Addressed:
Understanding placement and structural integrity of each wall-framing component.
Using distinct mathematical procedures to estimate units of stock needed to construct a given wall. This will be done with the use of a scaled drawing and an architect's scale.

Student Tasks:
Each student will draw to scale and define an elevation view of a wall section containing two corners, one partition, one door opening, and one window opening. Then using a different plan each student will create a materials list. The plan will be drawn with missing dimension lines so the students will have to scale measurements before using formulas.

Explanation of how learning tasks require higher level thinking:
- By drawing the wall section each student solves problems involving scale, such as in maps and diagrams. In order to make the drawing accurate the students use tools such as rulers, tapes, compasses, and protractors.
- Each student will create a material list by using a variety of methods to estimate the values, in appropriate units, of quantities met applications, and rounds numbers used in applications to an appropriate degree of accuracy.
- Creating an accurate materials list will prove that the student knows standard methods to solve basic problems and uses these methods in approaching more complex problems.

Teacher Responsibilities:
Teach lessons
Provide adequate hands on time to master new skills
Encourage with positive feedback and constructive criticism.

Materials & Equipment:
Overhead projector and information sheets in Appendix 1.

Resources:
CABO One and two family dwelling codebook 1995 with yearly blue page updates.
CIMC Residential Carpentry Module.

Student Learning Experience 2

Purpose:
To demonstrate proper horizontal layout that complies with the building code and teaches the fundamentals in a sequential manner in order to minimize confusion and maximize practical learning.

Estimated Time:

- ❑ One-hour lesson covering "on center" methods followed by actual 16" and 24" layouts.
- ❑ One-hour lesson covering "backers" such as corners, partitions, and blocking. Follow lesson with a layout and build session constructing 12" sections of all of the above.
- ❑ One-hour lesson covering window and door "rough openings" with load bearing headers and the mathematical methods to calculate them.

Standards:

602.9 Headers
602.11.1 Single Headers
602.11.2 Plywood Box Headers
Non-bearing wall Headers

E1. Reading

E1c. The student reads and comprehends informational materials to develop understanding and expertise and produces written or oral work that:

- **restates or summarizes information;**
- **relates new information to prior knowledge and experience;**
- **extends ideas;**
- **makes connections to related topics or information.**

E4b. The student analyzes and subsequently revises work to clarify it or make it more effective in communicating the intended message of thought. The student's revisions should be made in light of purposes, audiences, and contexts that apply to the work. Strategies for revising include:

- adding or deleting details;
- adding or deleting explanations;
- **clarifying difficult passages;**
- **rearranging words, sentences, and paragraphs to improve or clarify meaning;**
- **sharpening the focus;**
- **reconsidering the organizational structure;**
- rethinking and/or rewriting the piece in light of different audiences and purposes.

M2n. Solves problems involving scale, such as in maps and diagrams.
M6a. Carries out numerical calculations and symbol manipulations effectively, using mental computations, pencil and paper, or other technological aids, as appropriate.
M6b. Uses a variety of methods to estimate the values, in appropriate units, of quantities met applications, and rounds numbers used in applications to an appropriate degree of accuracy.
M6c. Evaluates and analyzes formulas and functions of many kinds, using both pencil and paper and more advanced technology.
M6l. Uses tools such as rulers, tapes, compasses, and protractors in solving problems.
M6m. Knows standard methods to solve basic problems and uses these methods in approaching more complex problems.

Key Concepts Addressed:
"On center"
Rough openings

Plan reading

Student Tasks:
Complete fifteen wall section layouts starting with basic 16” and 24” on center markings initially and work progressively toward a wall section containing two corners, one partition, one door opening, and one window opening.

Explanation of how learning tasks require higher-level thinking:

- Reading plans require students to solve problems involving scale, such as in maps and diagrams. This requires use of tools such as rulers, tapes, compasses, and protractors in solving problems.

- Calculating rough openings uses a variety of methods to estimate the values, in appropriate units, of quantities met applications, and rounds numbers used in applications to an appropriate degree of accuracy. It also evaluates and analyzes formulas and functions of many kinds, using both pencil and paper and more advanced technology.

Teacher Responsibilities:
Prep and teach lessons.
Be aware of each student’s progress.
Require one on one time to evaluate all students understanding.

Materials & Equipment:
Twenty laminated 2” x 4” x 16’ layout sticks
Overhead projector or LCD projector.
Resources:
CABO One- and two-family dwelling codebook 1995 with yearly blue page updates.
CIMC Residential Carpentry Module.

Student Learning Experience 3

Purpose:
To illustrate code compliant vertical wall sections including studs, jacks, cripples, window openings, door openings, and headers.

Estimated Time:
- ❑ One-hour lesson covering fundamentals of a Master stud.
- ❑ One-hour lesson covering where and how to read "window schedule". Follow lesson with a layout session of windows only.
- ❑ One-hour lesson covering window and door "rough openings" with load bearing headers and the mathematical methods to calculate them.

Standards:

602.7 Exterior Walls
- 602.3.1 Wind Pressure
- 602.3.2 Stud Spacing
- 602.3.3 Top Plate
- 602.9.4 Bearing Studs

602.10 Interior load bearing Partitions

602.11 Drilling and notching studs

602.12 Headers
- 602.11.3 Single Headers
- 602.11.4 Plywood Box Headers
- 602.11.5 Non-bearing wall Headers

E1. Reading

E1c. The student reads and comprehends informational materials to develop understanding and expertise and produces written or oral work that:

- **restates or summarizes information;**
- **relates new information to prior knowledge and experience;**
- **extends ideas;**
- **makes connections to related topics or information.**

E4b. The student analyzes and subsequently revises work to clarify it or make it more effective in communicating the intended message of thought. The student's revisions should be made in light of purposes, audiences, and contexts that apply to the work. Strategies for revising include:

- adding or deleting details;
- adding or deleting explanations;
- **clarifying difficult passages;**
- **rearranging words, sentences, and paragraphs to improve or clarify meaning;**
- **sharpening the focus;**
- **reconsidering the organizational structure;**
- rethinking and/or rewriting the piece in light of different audiences and purposes.

M2n. Solves problems involving scale, such as in maps and diagrams.
M6a. Carries out numerical calculations and symbol manipulations effectively, using mental computations, pencil and paper, or other technological aids, as appropriate.
M6b. Uses a variety of methods to estimate the values, in appropriate units, of quantities met applications, and rounds numbers used in applications to an appropriate degree of accuracy.

M6c. Evaluates and analyzes formulas and functions of many kinds, using both pencil and paper and more advanced technology.
M6l. Uses tools such as rulers, tapes, compasses, and protractors in solving problems.
M6m. Knows standard methods to solve basic problems and uses these methods in approaching more complex problems.

Key Concepts Addressed:
Building with templates
Sizing headers
Visual concept of cross-section views
Comprehension of code

Student Tasks:
Complete six vertical wall layouts starting with one including only full wall studs with each layout introducing more framing components. The sixth layout has two header sizes and three window heights.

Explanation of how learning tasks require higher-level thinking:
- Reading plans require students to solve problems involving scale, such as in maps and diagrams. This requires use of tools such as rulers, tapes, compasses, and protractors in solving problems.
- Interpreting codes restates or summarizes information relates new information to prior knowledge and experience extends ideas, makes connections to related topics or information.
- Calculating rough openings and header sizes uses a variety of methods to estimate the values, in appropriate units, of quantities met applications, and rounds numbers used in applications to an appropriate degree of accuracy. It also evaluates and analyzes formulas and functions of many kinds, using both pencil and paper and more advanced technology.

Teacher Responsibilities:
Prep and teach lessons.
Be aware of each student's progress.
Require one on one time to evaluate all students understanding.

Materials & Equipment:
Twenty laminated 2" x 4" x 16' layout sticks
Overhead projector or LCD projector.
Six sets of plans for layouts
Resources:
CABO One- and two-family dwelling codebook 1995 with yearly blue page updates.
CIMC Residential Carpentry Module.

Core Assessment

Estimated Time:
Forty-five minutes

Student Tasks (product and performance):
Individually construct 4’ x 4’ wall section with corners and window opening.

Explanation of How Assessment Tasks Require Higher Level Thinking:
- Each student will create a material list by using a variety of methods to estimate the values, in appropriate units, of quantities met applications, and rounds numbers used in applications to an appropriate degree of accuracy.
- Creating an accurate materials list will prove that the student knows standard methods to solve basic problems and uses these methods in approaching more complex problems.

- Calculating rough openings uses a variety of methods to estimate the values, in appropriate units, of quantities met applications, and rounds numbers used in applications to an appropriate degree of accuracy. It also evaluates and analyzes formulas and functions of many kinds, using both pencil and paper and more advanced technology.

Teacher's Responsibilities:
Prepare plans and schedule guest examiners from business community to evaluate and time assessment.

Materials & Equipment:
Provide a 10’ x 10’ work area with two saw horses and 11/4’ 2” x 4” ‘s

Resources:
Program advisory committee
CABO One- and two-family dwelling codebook 1995 with yearly blue page updates.
CIMC Residential Carpentry Module.